Aldermaston ▪ Reading
Berkshire ▪ RG7 4PR
www.awe.co.uk

Ref: FOI2021-006

[redacted]

19th August 2021

Dear [redacted],

Further to our email of 17th August 2021 regarding your request for the following information:

> *An academic of our institution has requested a copy of item from the Atomic Weapons Research Establishment for research purposes.*
>
> *We have been unable to locate the item within libraries and wondered if you were able to assist us in accessing a copy*
>
> *We can pay on invoice and prefer electronic supply.*
>
> *Details of items:*
> *Morris, J. R. (1974) An Examination of the Chemical Literature on Fingerprint Technology for the Period 1890 to August 1974, SSCD Memo 359, October. Aldermaston: Atomic Weapons Research Establishment.*

Your request has been handled as a request for information under the Freedom of Information Act 2000 (the Act) and we can confirm that the Atomic Weapons Establishment (AWE) does hold information in scope of your request.

We are able to disclose the following document:

Morris, J. R. (1974) An Examination of the Chemical Literature on Fingerprint Technology for the Period 1890 to August 1974, SSCD Memo 359, October. Aldermaston: Atomic Weapons Research Establishment.

This can be found at the end of this letter.

Please remember to quote the reference number above in any future communications. If you have any queries regarding the content of this letter, please contact this office in the first instance.

If you are unhappy with the way your request has been handled you have a right to request an internal review within 40 days of receiving this letter, by writing to information.requests@awe.co.uk or our postal address: Information Requests Team, AWE Aldermaston, Reading, RG7 4PR. If you are still unhappy after an internal review has been completed, under the provisions of Section 50 of the Freedom of Information Act 2000 you have the right to take your complaint to the Information Commissioner's Office. Please note the Commissioner will generally not consider a complaint until you have exhausted AWE's internal complaints process.

Aldermaston ▪ Reading
Berkshire ▪ RG7 4PR
www.awe.co.uk

Yours sincerely,

AWE Information Requests Team

S.S.C.D. Memo. 359

An Examination of the Chemical Literature on Fingerprint Technology for the Period 1890 to August 1974

J R Morris

October, 1974

An Examination of the Chemical Literature on Fingerprint technology for the period 1890 to August 1974

All the references to be found in 'Chemical Abstracts' are listed in Table I in chronological order. These have been broadly classified into five groups, viz:

L - The development of latent fingerprints
R - Record print reagents and systems
C - Corrosion of metals by fingerprints and prevention procedures
X - Chemical composition and physico chemical properties
I - Identification procedures, structure and safety.

Abstracts of these references which are pertinent to the current programme are collated under the above headings and briefly summarised.

TABLE I

Chemical Abstracts Number			Classification
6.	1727	Recording fingerprints on paper	R
7.	3584	Development of latent fingerprints	L
10.	959	Recording reagent	R
11	1275	Record print system	R
14	2302	Detection of latents on documents	L
18	2586	Aniline dye/heat fixation	L
19	711	Record print system	R
21	3920	U.V. reaction with fingerprints	L
22	4402	Methods for latents	L
28	1303	Phosphorescent ZnS powder	L
29	2885	Chloride in fingerprints	L
29	4291	Benzidine reagent for blood marks	L
29	6983	Recording system	R
30	701	Iodine reagent	L
30	1908	Powder incorporating Ag reducing agent	L
31	1127	Osmium tetroxide as a reagent	L
31	2968	Dyestuffs as powder reagents	L
31	3604	Recording	R
31	5487	Recording system (clean)	R
31	6582	Dyes	L
32	274	Powder for recording prints	R
32	1214	Detection of latents	L
32	1819	Rendering visible	L
35	703	Identification	I
35	3014	Paper for record prints	R
43	6258	Mercury poisoning from powders	I
45	1492	Cleaning fingerprints from metals	C
45	4351	Mercury poisoning	I
46	8604	Corrosion by fingerprint deposits	C
47	7093	Mercury poisoning	I
48	6920	Ninhydrin	L
48	7928	Degradation of plastics by finger deposits	C
48	10519	Corrosion of metals	C
48	11812	Recording ink	R
49	16276	Ninhydrin Patent	L
50	6713	Recording Pad	R
50	6985	Cleaning mixture-anticorrosion	C

Chemical Abstracts	Number		Classification
50	8401	Ninhydrin	L
51	11981,11982	Corrosion	C
52	9865	Detection by Alloxan	L
52	9865	Ninhydrin	L
52	9865	Transfer to celluloid	L
52	17572	Development reagent	L
53	6914	Detn. by silver nitrate	L
53	6915	Alloxan vs. Ninhydrin	L
53	14803	Photographic recording	R
53	18751	Detection	L
54	15070	Ninhydrin vs. alloxan	L
54	15070	Mixture for removing fingerprints	L
54	1244	N-w-aminoalkylamides; clearing reagent for metals	C
55	11705	Use of Hydrofluoric acid for marks on glass	L
55	12885	Ink applicator	R
55	23876	Radioactive methods	L
56	6308	Ninhydrin	L
57	3581	Removal - anti corrosion	C
61	8619	Detection on patterned surfaces	L
66	43025	$^{110}Ag\ NO_3$ autoradiographic	L
67	16722	Recording electrographic	R
67	49332	Development by N Act. Anal	L
68	8049	By electrophotography	R
68	106510	111444 hexafluoro 2 butane dithiol	
70	53048	Electrorecording	R
70	92265	Photographic emulsion for	R
72	73137	Liquid crystals	R
72	118285	Chloride detection	X, L
73	64450	Detection on paper	L
73	96904	Ag Chromate system	L
73	126740	Lecture and demonstration	L
74	30476	Fluoresence and U.V. spectra	X
74	40701	Hexathiocyanate nickelate reac^{n}.	R
74	97201	Detection	L
74	97365	Thermochromic system	R
77	110132	Review of methods	L
79	92552	Aminoacids by G.L.C.	X
79	81283	Removal from metals	C

Totals

L = 36
R = 19
C = 8
X = 3
T = 4

Chemical Composition and Physicochemical Properties

From the late nineteenth century the chemical composition ascribed to fingerprints has been that of sweat, and Popp (1928) reviewed the available information on this as a basis for chemical reagents. More recently (Cuthbertson 1969 and Morton 1970) have examined the composition and factors which cause variations in this composition for individual fingerprints. Measurements of physicochemical parameters such as U.V. absorption have been made by Ohki (1970).

The Development of Latent Fingerprints

Chemical Methods

Early experiments by Aubert and Coulier in which several chemical reagent systems for fingerprint components were developed are described by Forgeot (1891) and Ledent (1912). Of these systems, two which are still in current use are the application of iodine vapour and the silver nitrate method for chloride. The use of osmic acid as a reagent for fats was suggested by Forgeot, developed as a practical procedure by Mitchell (1920) and is described in some detail in his review paper of methods available to that date (Analyst (1920) 45, 122-9). Since that time various fixitive reagents such as starch have been suggested to improve the iodine method; the optimum concentration of silver nitrate for the chloride method together with measurements of its sensitivity and limitation have been established by Cutherbertson (1969) and chemical (i.e. photographic redox) reduction procedures have been put forward to reduce the processing time. No radical improvements have however been achieved with either of these procedures. Patents have been taken out on the osmic acid method by Lucas (1937) but no information is given on the sensitivity of this reagent.

The introduction of ninhydrin as a reagent for the amino acids by Oden (1954) was a major advance in detection methods. Comparisons between this reagent and iodine, silver nitrate, and alloxan (1957) confirmed that in the majority of cases the more favourable results were produced by the ninhydrin reagent especially for aged marks.

Since 1956 considerable interest has been shown in autoradiographic procedures using either labelled trace elements in the reagents or neutron activation techniques. Methods based upon ^{110}Ag, in silver nitrate, ^{14}C in formaldehyde, ^{35}S in sulphur dioxide and ^{24}Na obtained by neutron activation have so far been reported as possible methods for fabrics and physically difficult backgrounds.

Powders

For non absorbent surfaces the application of powdered materials and the subsequent removal of the excess by brushing, blowing, tapping etc. has been from the beginning the universal method of intensifying fingerprints on these surfaces.

By 1920 substances suggested for such use included mercury-chalk mixture, graphite, lamp black, ferric oxide, magnesium carbonate and some aniline dye stuffs; lycopodium powder-Sudan Red mixture, red lead oxide, lead carbonate, lead iodide and lead acetate. Methylene Blue powder has been used for highly glazed paper surfaces. Fixation by suitable varnishes was also established. Later (1928) aluminium powder, soot, cinnibar and indigo were added to the list. Zinc sulphide has been suggested as a phosphorescent powder and organic reducing agents (e.g. hydroquinone) have been used for a dusting/transfer system. A series of aniline dyes have been studied in some detail and the findings suggest that basic dyestuffs are favoured. The fixation of powdered marks by heat treatment (aniline dyes) is first recorded in 1917 and a lifting technique for developed powder prints was developed as early as 1913.

Record Print Reagents and System

Chemical methods for record printing rely upon coating the finger with material A, this is then placed in contact with a receptor surface containing material B. A rapid chemical reaction then occurs according to A + B $\longrightarrow$ C where C is a stable coloured product. The majority of the methods proposed are the subjects of patents and most rely upon the formation of insoluble coloured complexes of transitional metals. Many procedures involve the use of extremely toxic chemicals.

Physico-chemical methods based upon xerographic technique form the basis of three patents and the reaction of sunburn with a coalescible film one.

Corrosion of Metals

Major corrosion and degradation problems are caused by fingerprints being left on certain metal and plastic surfaces due mainly to their salt content.

Several patented solvent systems are reported for their removal.

C

Chemical Composition and Physiochemical Properties

(1927) C.A. 21, 3920
I. Tetsuichi

Deut. Z ges-ger Med (1927)
9 726-7

Reaction of ultraviolet light on body fluids and fingerprints.

(1) Physico Chemico Study of Latent fingerprints
Part I UV absorption and fluoresence of Human Epidermal secretion

H. Ohki

Kagaku Keisatue Kenkyusho
Mokoku (1970), 23(1) 33-40(Japan)

(1970) C.A. 74 30476

Gauze applied to human fingers for 7 hrs. was extracted with ether, or Eron/water. The water extracts showed characteristic U.V. absorption at 277 mμ (urocanic acid?) but not the ether extracts.

(2) Chemistry of Fingerprints

F Cuthbertson

AWRE Report O 13/69

CA. 72 11285

(1969)

The chloride level in fingerprints has been measured and its variation with age, sex, occupation and digit measured. Measurements have also been made of the chloride level in paper substrates.

Development of Latent Fingerprints

(1880) Skin furrows of the Hand

(1) Faulds, M. Nature (1880). 22, 165

(1905) Guide to Fingerprint Identification

(2) Faulds, M — Pub. Hanley 1905

(1912) Dactylography

(3) Faulds, M — Pub. Halifax 1912

(4) Forgeot, R
Arch d'Anthropal Criminelle (1891) 6, 387.

(1891)

Reaction of fingerprints with $AgNO_3$, $HgNO_3$, OsO_4 inks

Method for Revealing Fingerprints on paper.

(5) Ledent J R — Bull Soc. Chim Belg 26,12
C.A.6, 1727^5

1912 According to the Method of Aubert & Coulier.
I_2 vapour directed against the paper is fixed by the fingerprints and produces a yellow colour. This colour soon disappears. Gallic acid when used for fixation destroys detail. Moisturing the paper so that I_2 reacts with starch helps.

(6)
(1913) E Locard. L'Identification des Recidivistes (1903)
La Poroscopic (1913)

Practical Dactyloscopy

(7) D Crispo — Bull. Soc. Chim. Belg. 27, 190-3
CA 7 3584

(1913) Taking prints
(i) Wet fingers with Na_2S (10% Na_2S and 2% NaOH)
(ii) Wipe
(iii) Place on Pb, impregnated paper

This product can be converted to a paper negative by suitable treatment.

Proposed scheme for latent prints:
(1) Dust with lead acetate
(2) Expose to H_2S

Proposed lifting technique: Lift product with a gelatin/glycerol coated paper.

Fingerprint Recordation

(7) A.C.O. Bock — U.S. Pat.1,497,971 June 191
CA 18 2586 — U.S. Pat.1,497,972

(1917)

Brush mark with aniline dye then fix by heating. Alternative procedure is the use of Dragons blood and an aniline dye.

(8) C A Mitchell
(1920) C.A. 14, 2302[3] Analyst (1920), 45, 122-9

Brushing osmic acid solution on print, kept damp and exposed to sunshine - Print due to red^{n}. of O_s.

Osmic pyrogallol system investigated - 3 year old prints were examined. This is a water wet reagent.
Claim - iodine more sensitive than Osmium.
Excellent review of methods up to 1920.

(9) Chemical Development of Latent Fingerprints

G Popp Z Agrew Chem.(1928)41; 1005-7
C.A. 22 4402

(1928)
Constituents of fingerprints which may form basis for development reagents.

NaCl, urea, fatty acids, albumin, cellular materials and fats.

Chemical reagents - OsO_4, Sudan Black, Hg NO_3, Ag NO_3, cosin fushin, tannin

14 Fingerprint Detection

(10) CA 28 1303
(1934) H L Brose Analyst 59 25-7 (1934)

For the treatment of a multicoloured surface a phosphorescent ZnS powder is suggested. Illuminate resulting print with U.V. and photograph.

Chloride Fingerprint

(11) J Finn, R E Cornish In.Eng.Chem.(1935) 13; 74 & 5

C.A. 29, 2885 News Ed.

1935
Possible method based upon treatment of paper with Ag NO_3 sol^{n}. in the dark, dry, develop and fix with photographic sol^{n}.

(12) Method for Making Indistinct Blood Marks Visible

M Wagenaar Pharm. Weeblad (1935) 72; 463 - 70

CA 29 4291

1935 Benzidine reaction with blood as a way of improving fingerprint.

(13) Method for Making Latent Prints Visible

M Wagenaar Pharm Weeblad (1935) 72; 1265-71

(1935) CA 30, 701

Treat object with iodine vapour. A permanent copy is obtained by covering with a sheet of slightly moist paper carrying rice starched K I. Varnish product with a 3% sol^{n}. of dammar resin in benzene. Several copies can be taken.

Fingerprints

14 J J McCarthy — U.S.P. 2.028, 619
CA 30 1928 — U.S.P. 2.099, 028

(1936) An organic reducing reagent (e.g. hydroquinone HQ is incorporated in a powder (e.g. gum accacia) (Ratio 8 : 1). Dust Print. Place dusted print in contact with a photographic paper wetted with NaOH/Sod. sulphite sol^{n}. The Ag develops where H.Q. has contacted paper surface. Fix and wash.

(15) Treating Fingerprints

F F Lucas — U.S. Pat. 2,066, 535
CA 31 1127

(1937) Marks containing fatty substances such as sebum from skin are reacted with Flemings Reagent vapour until visible and then with an aqueous dye such as 'diazine fast yellow' which fluoresces in the U.V.

(16) Dye stuffs for developing Latent Fingerprints

H A Thomas — Analyst 62, 539

(1937) CA 31 6582

Waxoline yellow OS, Waxoline Orange AS, Waxoline red AS and Waxoline Violet 2BS used as powders to develop marks. These are subsequently fixed with with AcOH and steam.

H A Thomas — Analyst (1937) 62 197
CA 31 2968

Victoria Blue B.S. (Basic dye stuff)

F F Lucas
(17) CA 32, 1214 — Brit. Pat. 473,043 October 1937

Treatment of fatty substances with Flemmings reagent e.g. mixture of O_sO_4, chromic acid and glacial acetic acid followed by dye (c.f. CA 31 1127).

(18)
(1954) Detection of Fingerprints by the Ninhydrin Reaction

S Oden — Nature (1954) 173, 449-50

CA. 48 6920
0.2% ninhydrin in acetone, 80°C few mins.
2 days to 'cure'.

CA. 49 16276 — U.S. Pat. 2,715,571 Aug. 16 1955

(1955) 02% ninhydrin, 4% HOAc in acetone or similar solvent.

(19) Detection of Sodium by radioactivation by use of Neutron irradiation

D Yamamoto — Kagaku 29 208

CA 53 18751

(1956) Autoradiography of ^{24}Na prepared by irradiation in neutron source (1 x 10^{11} n/sq.cm/sec) for 7 hrs.

Autoradiography 6 days contact time
Could be applied to fingerprints

(20) Detection of Fingerprints using Alloxan

K Motosada
CA 52 9865

Kagaku to Susa (1957)
10(5);

(1957) A 0.1 to 0.2% alloxan sol^{n}. in MeOH when sprayed gave orange-yellow fingerprint. Also ninhydrin 10(4) p5-9 transfer of oily marks from celluloid (10(4)) 33-6.

Development of latent fingerprints by the ninhydrin reaction combined with $AgNO_3$

(21) Y Noguchi, K Onda
CA 53 6914

Kagaku to Sosa (1958)
11(2) 126-31

(1958) Subsequent application of $AgNO_3$ to a print sample developed by ninhydrin gave a new mark not previously seen.

(22) Comparison between Ninhydrin and Alloxan methods for detecting Fingerprints

M Kanda, T Itasaka
(1958) CA 53 6915

Kagakuto Sosa (1958)
11 (2); 152-7

A 0.5% sol^{n}. of Alloxan in ETOH is recommended for revealing fingerprints. A 0.5% ninhydrin in acetone is better than alloxan for papers coloured other than white and for wood.

Comparison of the Ninhydrin and Silver Nitrate Methods

(23) Y Mikami
CA 54 15070

Kagakuto Sosa (1959) 12
518-22

(1959) Ninhydrin is excellent for aged marks. $AgNO_3$ is only suitable for those 3-4 days old.

Erasing Ninhydrin developed Fingerprints

(24) M Kanda
CA 54 15070

Kagakuto Sosa (1959) 12
523-6

(1959) Removal by washing well with a (0.3%) solution of H_2O_2 in acetone. (9:1) The claim is that ink is not affected.

Fingerprinting using Radioactive Materials

(25) T Tackeuchi
CA 55 23876

Jap. Pat. 9150 - (60)

(1961) C^{14} Formaldehyde in sol^{n}. Dry at 80°C for 10 min. Autoradiograph. Xray film 5 days

(26) A simple Radiographic method for Dactyloscopic Studies

A. Ya. GEL'FMAN, G L Granovski
C.A. 61 8619

At. Energ.(USSR) 17(1);7

(1964) Fingerprints on patterned surfaces developed by ^{14}C formaldehyde fixation of the aldehyde by reaction with amino acids is claimed.

Application of silver nitrate labelled with ^{110}Ag for Autoradiographic detection of fingerprints

23

K Akerman
CA 66 43025

Int. J. App. Radiat. Isotopes (1966), 17(11-12); 657-61

(1966)

Method for detecting presence of fingerprints using 0.01N carrier soln. of $AgNO_3$ having a max ^{110}Ag sp.ac of 2.0 to 2.5 counts cm^{-3}. An empirical relationship between exposure time for autoradiography and the solution count rate is given.

24 Nuclear Techniques in Forensic Science

R F Coleman
(1967) CA 67 49332

J. Brit. Nuc. Energy Soc.1967 6(2); 134-8

Application of activation analysis to forensic problems including fingerprints.

25 Chemistry of Fingerprints

F Cuthbertson

AWRE O 13/69

(1969) CA 72 11285

Det^{n}. by chloride reaction. 1% $AgNO_3$ recommended as optimum concentration.

Detection of a fingerprint with Silver Chromate

26 Fumiaki G, F Ishino

CA 73 96904

Hoi, Kanshiki Narabini Shaka Igaku Zasshi (1969) 6(3-4), 93-7

(1969)

Chloride in fingerprint forms AgCl with Ag_2CrO_4. This is developed photographically after removal of excess Ag_2CrO_4 by 5% nitric acid and washing. For preparation of the Ag_2CrO_4 paper, treat photographic paper with $Na_2S_2O_3$ solution, wash, dry and treat with 2% K_2CrO_4 for 10 mins. Dry, then treat with 1% $AgNO_3$ for 10 min. and dry again.

A fingerprint on paper is transferred onto Ag_2CrO_4 paper by pressing or electromigration.

Use of Ninhydrin in Detection of Fingerprints

27
(1970) E C Bastos
CA 73 64450

Rev. Brazil Farm (1970), 51(1), 25-7

1% Ninhydrin/acetone 5 mins 100°C.
colouration disappears after ~ 14 days.

Detection of fingerprints with sulphur 35

28 D J Spedding
CA 74 97201

Nature (1971) 229 (5280) 123-4

Extraction of bound SO_2 cpds suggested that reactive compounds were
(1971) lipids.

Attempts to identify specific compounds were not successful.
Oleic and Binoleic reacted well with SO_2.
The extension of Grant (1963) are reported.

3-220012

Methods for the Development of Latent Fingerprints

29 (1972) C M Connor
CA 77 110132

J. Ass. Off. Anal. Chem. (1972) 55(4), 827-31

Available methods for the development of latent fingerprints and some problems which arise during examinations that affect document examination chemical analysis are reviewed. 6 refs.

Neutral Chelates having a transition metal attached to one, two or three $SC(CF_3)$: $C(CF_3)S$ groups

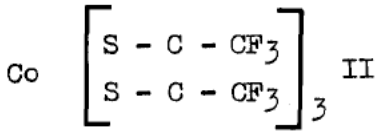
30 (1968) R B King
CA 68 106510

U.S. Pat. 3,361,777 (1968)

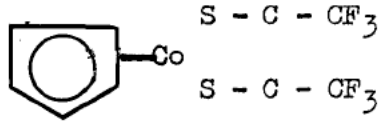
These compounds are either bis or tris i.e. ML_x x = 2 or 3 of ligand bis (trifucromethyl) 1:2 dithi combined with a transitional metal ion.

for example $MS - C - CF_3$ (I) with cobalt produces complex II

$MS - C - CF_3$ When combined with cyclopentadienyl then a 1 : 1 compound of the type III is produced.



II



Such compounds find a variety of applications.

They can be used for antiknock additives, oxidisers and the development of fingerprints.

Record Print Reagents and Systems

Compositions of fingerprints

1 H Jorgensen U.S. Pat. 1, 170, 273. Feb. 1

(1915) C.A. 10, 959

Surface of paper is coated with an aqueous Gelatin, Glycerol soln. containing $K_4 FeC_6N_6$. The fingers are treated with $FeCl_3$, $Ca(OCl)_2$ HCl solution. Reaction occurs when the paper is contacted by the fingers.

Obtaining Thumb Prints by Chemical Means

2 E Bang F.Pat. 480,067 June 15 1916
C.A.II 1275[2]

(1916) Moisten a finger with a solution of $FeCl_3$, $CaCl_2$, HCl mixture. Place the finger on paper impregnated with gelatin bound pot. prusside.

Fingerprints

3 A J Drumond U.S. Pat. 1,501,841 July 15 1924

(1924) C.A.19 711[6]

Fingerprints or similar records obtained by using a mixture of Ag, Cu, Hg, Bi or chelate of Pb with palsum of copaiba followed by sulphide treatment.

Taking of Fingerprints

4 Wm. Heinecke Brit. Pat 428,306 May 13th 1935
C.A. 29 6983, CA 31 3604

(1935) A colourless aromatic hydrocarbon derivitive (A) placed on finger; another colourless material(B) impregnated into substrate when brought together a coloured product formed e.g.

Trimethyl phluoriglucinol carboxylic acid (A) with $FeCl_3$ or other iron or vanadium salts (R) gives a coloured metal complex.

Fingerprinting

5 Wm. Heinecke U.S. Pat. 2,082,735 June 1st , 1937
C.A. 31 5487

(1937)

Sod. vanadate dissolved in glycerol-diethyleneglycol solution is used to wet the finger; the finger is then brought into contact with a support material containing a mixture of trihydroxy benzoic acid, tartaric acid, and a thickening agent to give a black print.

Fingerprinting

6 M E Freudenheim U.S. Pat. 2,104,586

(1937) C.A. 32 1819

An Fe soap is applied to the finger. Tannic acid impregnated paper is used as the receptor.

Reproduction Process

7 G Propstl U.S. Pat. 2,732,286, (1956)
(1956) CA 50 6985

A printing process based upon a carrier such as paper or plastic coated with 0,02→2μ of Al, Zn, Cd.

Fingerprint reproduction by a completely dry process is claimed.

Composition for Developing Fingerprints on a Photographic Film

8 I M Hunsberger U.S. Pat. 2,879,160
(1959) CA 53 14803 March 1959

Fingerprints applied to high speed panchromatic photographic film in total darkness may be developed by a modified D-19 developer to produce record prints.

Electrographic Image Formation

9 Rank Xerox Brit. Pat. 1,085,573
(1968) CA 68 8049

A xerox system and modifications is described.

Fingerprint Recording

10 K Obuchi U.S. Pat. 3,408,217 Oct. 1968
CA 70 53048
(1968)

Electrostatic fingerprint recording superseding Jap. Pat. 290,926, has lower voltage requirement, less handling problems and no reversal development problems. It is a xerographic system.

Chemical Fingerprinting method without staining

11 H Ebara Kagaku Keisatsu Kenbyusho Hokoka
(1969) CA 74 40701 (1969) 22(3) 156-60 (Japanese)

Ni(II) ion reacts rapidly with rubeanic acid in alkaline medium to give a blue water insoluble complex.

Ink formed from rubeanic acid and surfactant placed upon fingers. Paper impregnated. hexathicyanatonickelate forms the pad

Coalescible Film

12 R B Hartman U.S. Pat. 3,431,131 March 1969
CA 70 92265
(1969) Opaque pressure sensitive coalescible film(c.f.U.S.P. 2,957,791)may be imaged with fingerprints due to transfer of sebaceous oil. The image is developed and made permanent by heating at 145 - 80°C for 1-25 sec. The film is composed of a hydropholsic organic addition polymer having an open cell structure.